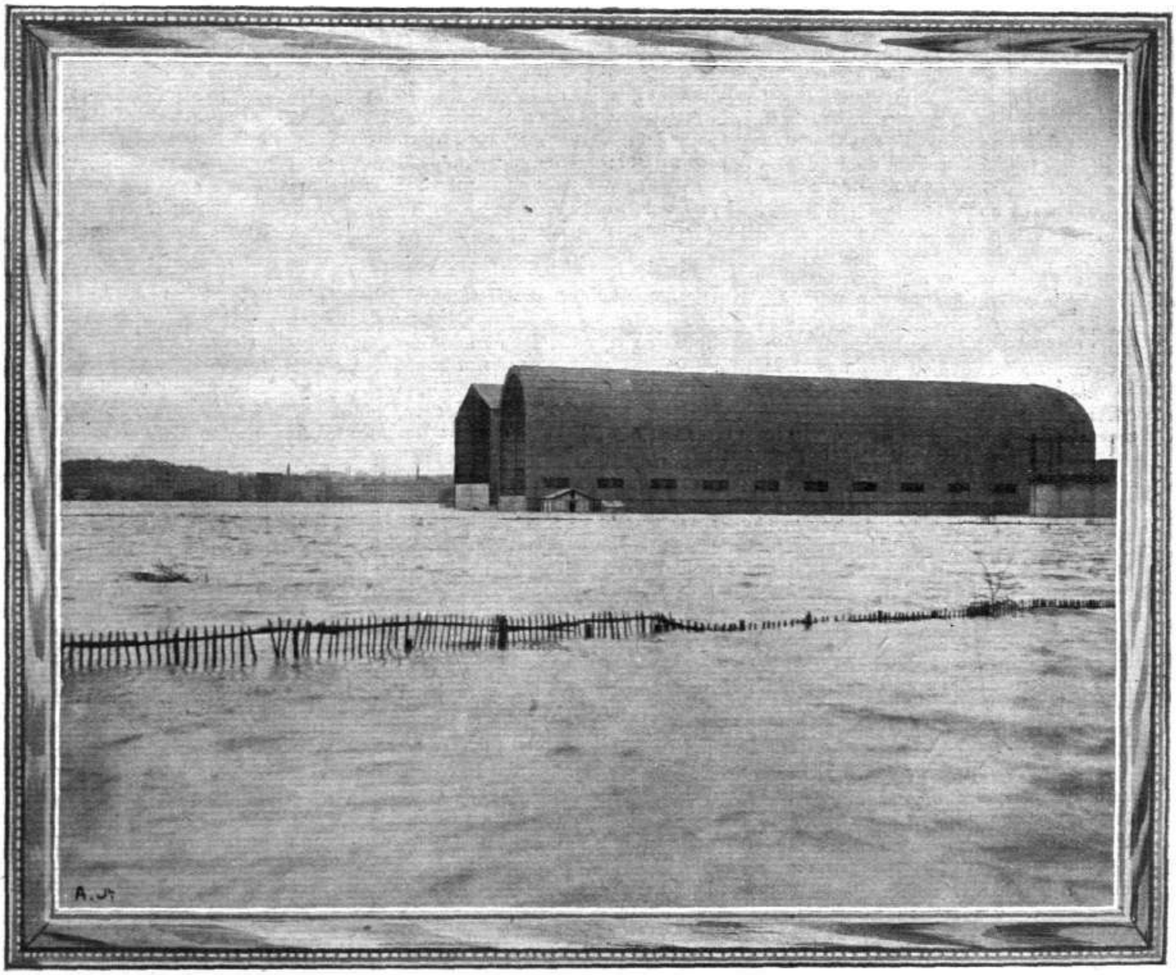
FLIGHT

First Aero Weekly in the World.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE AERO CLUB OF THE UNITED KINGDOM.

No. 59. (No. 7, Vol. II.) | FEBRUARY 12, 1910. | Registered at the G.P.O. as a Newspaper. | Weekly, Price 1d. Post Free, 1½d.



AVIATION AND THE FLOODS IN FRANCE.—The flying grounds at Issy-les-Moulineaux, showing the two airship hangars entirely surrounded by the waters of the Seine.

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A FLIGHT-MODEL CLUB FOR LONDON.

A LETTER, which we publish in another column, from Mr. A. C. Horth, embodies the carrying out of an idea which in our judgment is excellent, and should receive a very large measure of support from those interested in the scientific development of aviation. The idea of a Model Aeroplane Club is not a new one, but the difficulty in bringing many commendable schemes to materialisation often is that the enthusiastic pioneer with the necessary time and qualifications properly to see the idea through is not always to be found. But here apparently is not only the inception of the scheme, but the needful executive to give the thing a start. Mr. Horth's idea is to convene a meeting of those interested, and to get to work at once with the formation and carrying on of the club.

Being thoroughly satisfied that a club such as he proposes must tend materially to the advancement of the science and sport, we commend him and the idea to the consideration of those of our readers who are in a position to benefit by the proposal.

There are many people, no doubt, who incline to the opinion that the making and flying of model machines is more or less waste of time, and that the limitations of those models are so great that the useful lessons to be learnt from this form of experiment are too slight to justify the time spent upon them. But even if this were so—which we cannot admit—there are other considerations bearing upon the matter that would impel us to lend our support to a Model Club. To begin with, there is the educative effect to be reckoned with. The intelligent youth of the country is at the moment taking the very greatest interest in the problem of flight. Every other lad, even, is constructing his model flyer, with which he achieves more or less success, and according to the measure of his success or failure so his interest in flying waxes or wanes.

As things are at the moment, much of the effort that is being put into the attempt to solve the flight problem—in this direction at least—is detached and undirected. The experimentally-minded youth of to-day is the potential inventor and aviator of to-morrow, but in this, as in everything else, his experiments would be the more satisfactory to himself, and the more likely to be of benefit in the direction of development if he had more opportunity of working in accord with, and to a great extent in competition with, those who are experimenting along similar lines. Often an invention contains the rudiments of a great achievement, but fails in consequence of some slight inherent defect which has escaped the notice of the inventor himself, but is discovered and eliminated in consultation with others. Herein lies one of the possibilities of the Model Club. There must be many whose experiments with models have proved more or less unsuccessful because of some slight want of knowledge which they have no opportunity of acquiring by reason of there being no association for bringing the enthusiasts of model flying together for discussion. And nothing so disheartens the average experimenter as continual failure.

Another reason why the suggested Club is entirely desirable is that there are few amusements that pall upon the generality of people sooner—we do not, of course, include the true enthusiast—than that of flying model aeroplanes. The main reason why this is so is the want of any clearly defined objective or organised system of competition. The average person begins his experiments, bubbling over with enthusiasm, probably in the company of two or three others as enthusiastic as himself, but before long the element of competition, so essential for the good of any sport, drops out. Each knows to the inch the capacity for flight of the other's machine, all have reached the point to which it is possible for their collective knowledge to take them; and since all finality means stagnation, enthusiasm evaporates and the sport is relegated to the background. This would not be so if any strong club or association were available for the encouragement of the sport and the assistance of the individual.

There is still another point to be borne in mind when considering this question of a Model Club. The opposition and the public prejudice that the motor car has had to fight against during its years of pioneering has been due more than anything to the fact that the public mind had not been sufficiently prepared for it. The idea of a self-propelled vehicle, capable of the speed of a train, running upon the public highways, was altogether new; and as we are above everything a conservative people, the notion had to be looked upon with the deepest suspicion and distrust. Had it been possible to educate the public mind thoroughly up to the idea that the motor car was a safe and proper means of locomotion before it became a feature on the road, the opposition would have been greatly less. Now, in the matter of flight, the more the man in the street can be got to look upon it as something entirely natural and familiar, the less prejudiced he will necesarily become against the time when the aeroplane is ready to take its place with the motor car and the motor boat as a method of locomotion. That the sport of model flying must react beneficially in this direction cannot be doubted. By it, flight is brought closely under the notice of the community. And the more familiar the idea of flying is to the average individual, the less likely he will be to raise active opposition when the aeroplane begins to be actively in evidence.

In conclusion, the formation of a Model Club for London has everything to be said in its favour; the proposed initial locale—Blackheath—is eminently suitable for its headquarters; the moment is opportune, while enthusiasm runs high; and we have that indispensable person, the enthusiast with the time and ability to put in that hard and sometimes thankless work that falls to the lot of the pioneer.

Assuming that the Model Club is duly formed, we commend to its executive the idea for "Flight Golf" competitions put forward in our columns a few weeks ago. Even in a club with a large membership we can quite foresee that there is likely to be some little difficulty in keeping the sporting idea as much alive as it ought to be where competitive events are limited to such events as the model flyer is capable of "on its own," so to say. In order to sustain interest, we have to look beyond competitions of the more formal kind for which some sort of official observation is required, and in our suggestion we are egotistical enough to think there lie great possibilities. With headquarters at Blackheath, there ought to be every facility to hand for the early evolution of the game, and we are confident that not only would it prove interesting but that it would assist very materially in the development of the model flyer.

Flight Pioneers.

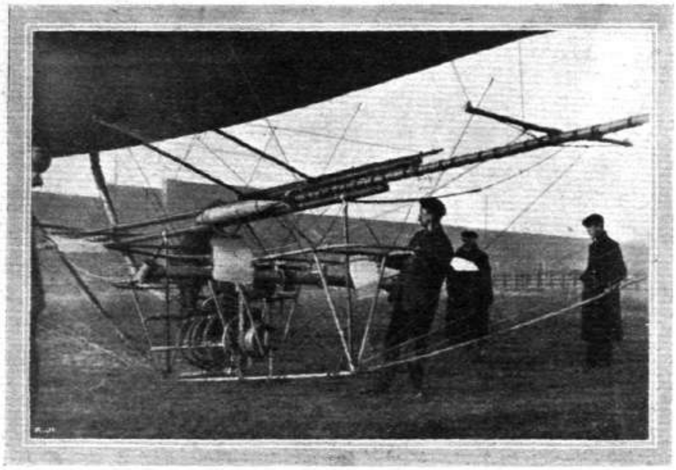
MR. HENRY FARMAN.

BRITISH DIRIGIBLES.

THE WILLOWS DIRIGIBLE.

By E. T. Willows.

THIS airship is the outcome of five years' experimental work, and embodies special consideration of the steering mechanism, which has been reduced to extreme simplicity. It will be seen from the photographs that there is a complete absence of the usual elevating planes, with their attendant increase of weight and head resistance.



Front view of the car on the Willows airship, showing suspension boom, propeller guard, &c.

The elevation of the dirigible is accomplished by the same set of propellers that produce the forward drive, and by this means it is possible to rise in the vertical plane to any desired altitude even with the whole system heavier than air, and also to rise diagonally in any angle between the vertical and horizontal.

One instance when this direct lift would prove of great value would be in the case of a machine becoming rain-soaked and unable to raise itself by the lifting power of the gas, as occurred at the Crystal Palace when the "Nulli Secundus" was docked there.

In practice the machine is ballasted, so as to have just sufficient buoyancy to lift the 150 ft. trail-rope, and is then driven to the desired altitude, or driven downwards, by the propellers as required.

It has taken some considerable time to perfect this device, because the control of this movement, when applied to a bevel-driven propeller-shaft revolving at high speed, becomes most difficult in practice where ease and quickness of operation are essential.

Other features of this airship are its symmetrical appearance and the ease with which it can be dismantled; in fact it is possible to pack the whole apparatus upon a one-horse trolley for transport.

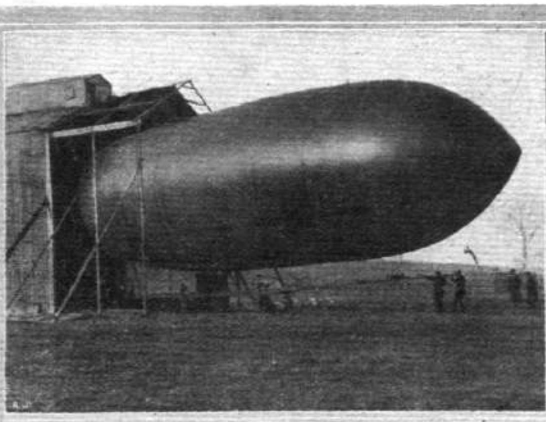
The system upon which the dirigible has been built is now rigid, and while the present machine is quite small, having been constructed for demonstration purposes, it is possible with a few modifications to lay down a dirigible on the same lines of any size.

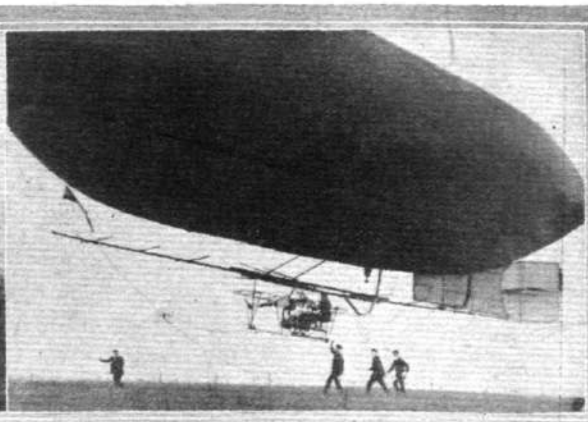
The following are the leading dimensions and details:—Envelope length, 86 ft.; diameter, 22 ft.; fish-shaped, having the greatest diameter about one-third in from the nose, capacity 21,000 cubic ft. The usual valves are fitted; top gas valve, automatic gas and air valves, and ripping panel; a ballonette of one-tenth capacity is placed in centre of lower half of balloon. The suspension is taken by ropes from a canvas band, sewn round the envelope, to a boom 58 ft. in length, built up of 3 in. bamboos and a light 3 in. steel tube.

The car containing the motor, propelling gear, and operator's seat is hung below the boom by steel cables.

A balanced rudder of 56 sq. ft. area is carried at the extremity of the boom also a vertical vane, which has a steadying effect upon the forward motion of the airship.

The car is of triangular section and 10 ft. in length, built of steel tube braced with steel wire; the motor, a 30-h.p. 8-cylinder J.A.P., drives a right and left hand





The Willows airship emerging from its dock on the left, and on the right the aeronaut's car, engine, &c., are seen clearly as well as the rear end planes.

propeller placed one on either side of car, through belting and bevel gear.

The propellers are of steel tube with aluminium blades; a guard is fitted to prevent any possibility of damage to the balloon by fracture of a propeller.

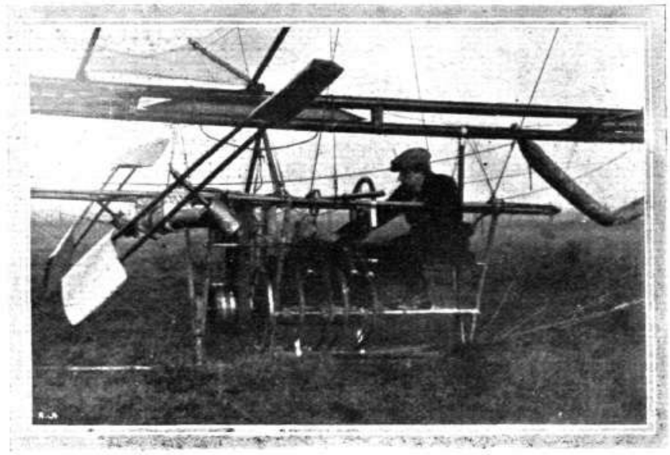
The control consists of a steering wheel, which by rotary movement operates the rudder and by a sliding movement alters the position of the propellers for ascending or descending.

A clutch lever and throttle completes the control, so that the machine can be driven single handed, the operator also having the balloon valve lines within reach, which enables a passenger, or for military purposes an observer, to be carried.

The weight of the complete car is 550 lbs., the suspension boom 100 lbs., gas-bag 350 lbs. and rudder and vane 21 lbs.

The erecting of the machine and most of the construction has been carried out at Cardiff, the whole of the airship being British-built.

The trials which took place during last November and December from my balloon-shed on the East Moors, Cardiff, were satisfactory in every way, and the airship is at present being overhauled in preparation for some tests of a more severe nature to take place in a few weeks' time.



Mr. E. T. Willows in the car of his airship.

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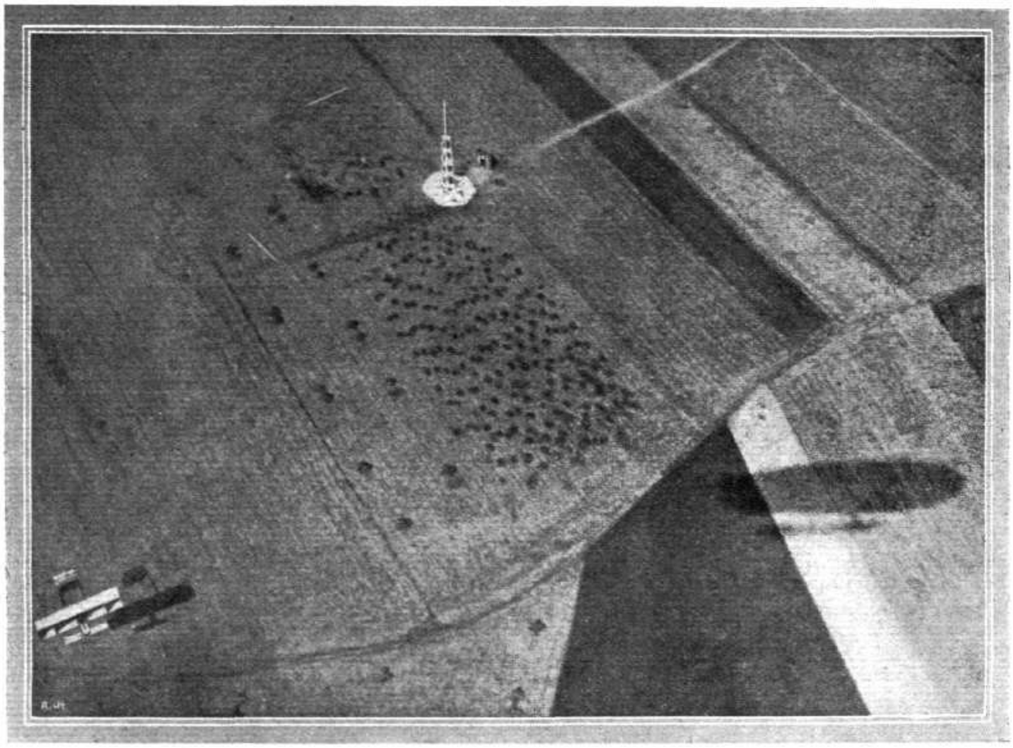


SEEN FROM ABOVE.—Striking photograph taken from an airship during the Rheims Aviation Meeting last year. On the left is a biplane in full flight, whilst the shadow of the dirigible itself from which the picture was snapped is seen on the right. Note also the pylone and the white guide marks on the ground, which were used for indicating the "course" for the flying men.

AERIAL PROPELLERS.

BY A NAVAL CONSTRUCTOR.

(*Continued from page* 92.)

CHAPTER III.—Water Propellers and Air Propellers Compared.

THERE appears to be, at first, a decided difference between the action of the water propeller and the air propeller. One is working in a practically incompressible fluid whilst the other is working in a compressible one. They present, however, the same problem to the designer of propellers.

This was first pointed out and verified experimentally by Mr. A. W. Johns in a paper read before the Institution of Naval Architects, in 1904. The following will show in a general way why this is so :—

Suppose we have a propeller of 8 ft. diameter working in an aeroplane and developing a thrust of 150 lbs.

These are quite average figures.

The area of such a propeller (two-bladed) would be about 6 sq. ft.

The 150 lbs. is the resolved component of the pressure, on the propeller blade, in the direction of advance. The actual pressure, therefore, would be more than this.

Say 240 lbs. at the outside.

Thus the pressure per sq. ft. on the propeller blade would be $\frac{240 \text{ lbs.}}{6} = 40$ lbs. Now atmospheric pressure is approximately 15 lbs. to the sq. inch, that is $15 \times 144 = 2{,}160$ lbs. per sq. ft.

Thus the additional pressure of 40 lbs. to the sq. ft. would, by Boyle's law, compress the air very little.

The amount would be $\frac{40}{2{,}160+40}$ = under 2 per cent.

For all practical purposes in air-propeller design, therefore, we may take it that the air is an incompressible fluid.

Thus the ratio of the thrust of a propeller working in air, and water, is the direct ratio of the density of the air to the density of the water.

For air at the ordinary temperature and pressure this is about $\frac{1}{780}$.

Thus if we know the performance of a water-propeller, under certain conditions, we should be able to calculate for the air-propeller working under the same conditions.

It is evident, therefore, that we can use the results of experiments on water-propellers for the purpose of designing air-propellers.

CHAPTER IV.—Formulæ for the Comparison of Model and Full-size Propellers.

The generally accepted formula for getting the thrust of a propeller is $T = K V^2 D^2$ where T is the thrust in lbs., V = velocity of the propeller forward in feet per second ; in the case of an aeroplane propeller this would be equal to the velocity of the aeroplane itself.

D = diameter of the propeller in feet, and K is a constant which is the same for all "similar" propellers ; by similar we mean that one is an exact counterpart of the other, but is made to a different scale.

The propellers must, of course, be running at the same slip. Having found K by means of a model experiment we can apply it to the full-size propeller.

The above equation is sometimes put in a different form. Thus, if s is the slip, R = revolutions per second, and p = pitch of propeller in feet.

Then from our definitions given previously we have, $V = Rxp\,(1 - s)$, hence $T = K\,(1 - s)\,R^2 p^2 D^2$.

Throughout this book we shall use the formula $T = \frac{K}{1000} V^2 D^2$.

In the experiments the model is run at different slips, and the thrust and efficiency calculated in each case.

Curves are then plotted on squared paper showing the variation of thrust and efficiency with slip.

These curves are given later for all propellers likely to occur in practice, for two-bladed propellers.

Now R. E. Froude, in his experiments, found that the relative thrusts given by propellers having two, three and four blades were as ·650 : ·865 : 1 ; the propeller in each case running at the same slip.

The efficiency, however, does not alter appreciably, except when blades of much higher disc area, *i.e.*, wider blades, ratio than those already given are used.

Hence if we wish to correct the following curves of thrust for three and four-bladed propellers we simply multiply by 1·33 and 1·55 respectively.

These are experimental results. From ordinary considerations we should expect the above figures to be 1·5 and 2·0 respectively, but this is not so.

Thus two two-bladed propellers working on different shafts will give about 30 per cent. more thrust than one four-bladed propeller having the same diameter and blade area ; the efficiency, however, will be very nearly the same.

CHAPTER V.—Information Required to Determine the Type of Propeller to be Used.

Before it is possible to carry out the design of the propeller or propellers for an aeroplane it is necessary to know two things :—

1. The thrust required of the propeller.
2. The speed of the aeroplane itself relative to still air.

The aeroplane as constructed at present has only one speed relative to still air, and consequently it requires a certain definite thrust to keep it at this speed.

If we increase the thrust above this amount the machine will rise higher in the air, and if we decrease the thrust the machine will come to the ground.

The speed of an aeroplane, and the thrust necessary for its flight, should be known to the designer, if the design has been scientifically carried out. Data obtained from a previous design which has flown are invaluable when a new design is in preparation.

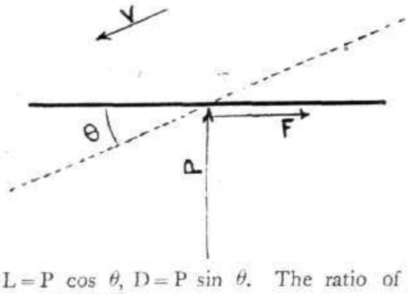
The following investigation of the action of the inclined plane, although not directly connected with propeller design itself, should be helpful in making a fair estimate for the quantities mentioned above.

The surface is taken to be a plane, but the results are only very slightly different when applied to a surface with a slight camber on it.

Suppose we have a perfectly frictionless plane surface, A, B, being forced through the air with a horizontal velocity V at an inclination θ to the horizontal.

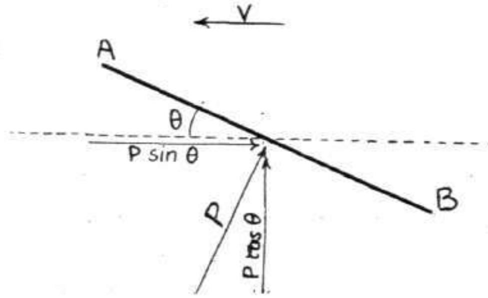
Experiment shows that the normal pressure of the air on this surface up to 30° inclination to horizontal is given by $P = c\,A\,V^2 \sin\theta$, where a is the area of the plane surface and c is a constant determined by the experiment. The force P can be resolved into a horizontal force, $P \sin\theta$, and a vertical force, $P \cos\theta$. The force $P \sin\theta$, necessary to push the plane through the air, is called the drift, = D say.

The force $P\cos\theta$, representing the amount the plane is capable of supporting, is called the lift $= L$ say.



Thus $L = P\cos\theta$, $D = P\sin\theta$. The ratio of lift to drift $= \frac{L}{D} = \frac{P\cos\theta}{P\sin\theta} = \cot.\ \theta$

From this it appears that by making the angle of incidence of the plane smaller and smaller, we might



get as large a value of the ratio, lift to drift, as we may desire. It would, indeed, be possible, if the plane were frictionless.

Skin friction, however, which is always present, modifies this ratio considerably.

The force of skin friction on a surface can be represented by $F = fAV^2$ where f is a coefficient determined by experiment, A is area of surface and V is the velocity of the fluid past the surface. The forces on the plane are now as shown in the figure.

From this we see that the lift $L = P\cos\theta - F\sin\theta$ and the drift $D = P\sin\theta + F\cos\theta$ the ratio $\frac{L}{D}$ being $\frac{P\cos\theta - F\sin\theta}{P\sin\theta + F\cos\theta}$.

Obviously this value is less for all angles of incidence than the case where the plane was frictionless. The following table has been prepared showing the manner in which the ratio $\frac{L}{D}$ varies with the angle of incidence for a frictionless plane and one with friction.

This table has been calculated by taking the value of the co-efficient c to be equal to ·006, and the co-efficient $f =$ ·00001.

These values represent the means obtained by comparing the results of several experimenters.

It will be seen that the ratio $\frac{L}{D}$ in the plane with friction first rises to a maximum, as we increase the angle of incidence, and then falls off again.

Angle of incidence of plane.	Total lift in lbs. per sq. ft. at 60 ft. per sec.	Ratio $\frac{L}{D}$ without friction.	Ratio $\frac{L}{D}$ with friction.
degrees.	degrees.	degrees.	degrees.
0·5	0·19	114·6	5·0
1·0	0·38	57·3	8·9
1·5	0·57	38·2	11·1
2·0	0·75	28·7	12·1
3·0	1·13	19·1	11·9
4·0	1·51	14·3	10·6
5·0	1·89	11·5	9·4
6·0	2·26	9·7	8·3
7·0	2·64	8·2	7·4
8·0	3·02	7·2	6·6
9·0	3·40	6·4	6·0
10·0	3·77	5·7	5·5

The angle which gives the maximum ratio $\frac{L}{D}$ can easily be worked out by the aid of elementary calculus. In this case it is 2·35°, giving a ratio $\frac{L}{D} = 12·25$.

The idea of increasing the ratio of lift to drift, by diminishing the angle of incidence, has, therefore, its limitations, since, after a certain small angle is reached, this ratio diminishes again. The Wrights observed this when their gliding experiments were being carried out. (*See* FLIGHT, Vol. I, page 723.)

It is seen that as the angle of incidence increases, the ratios $\frac{L}{D}$ tend to approach the same value for a plane with and without friction. The above co-efficient of friction represents a moderately good surface, such as might obtain in present-day aeroplane practice.

It is extremely important to notice that the actual lift of a plane travelling with a certain speed at a given angle of incidence, is not appreciably altered by the presence of friction; it is the drift that is affected by this.

The head resistance of the frame of the aeroplane and engine has not been considered in the above. The actual ratio of $\frac{L}{D}$ would be under that given in the table. The diminution, however, ought not to exceed ·5.

In any design we can get the same lifting power for a certain speed with a smaller plane area by increasing the angle of incidence. This in itself means less weight.

The ratio $\frac{L}{D}$ however, is diminished, and it is a question of calculation by trial and error which of the two systems requires the smaller thrust to propel the machine. In actual practice the ratio $\frac{L}{D}$ varies between 4 and 9.

The Wright machine has a ratio of $\frac{L}{D}$ equal to 8 approximately, but the Blériot aeroplane cannot be much over 4.

A good value is anything between 6 and 9, say 7·5. This admits of a fairly good lifting power, together with a moderate amount of supporting surface. That is to say, the thrust required should be $\frac{1}{7·5}$ of the total weight of the machine.

(*To be continued.*)

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Army Flying School at Hounslow.

A LARGE shed is being erected on Hounslow Heath, which is, we understand, to accommodate the Wright flyer to be used by the army officers for their aeroplane training. It is probable that the Hon. C. S. Rolls will be actively identified with the initial training of the first flying pilots of the British Army.

EFFECT OF THE WIND ON FLIGHT SPEEDS.

BY LOUIS TOFT, M.Sc.

THE problem relating to the motion of a flying body relative to the earth, the velocity of the wind, and the velocity of the body relative to the air being known, seems to be presenting some difficulty to many people interested in the science of aviation. The problem becomes very much simplified when it is noticed that the motion of a flying body consists of two portions, the first being the motion which the body performs relative to the air, and the second the motion which the body has due to its being carried along with the air itself at the same speed as, and in the direction of, the wind.

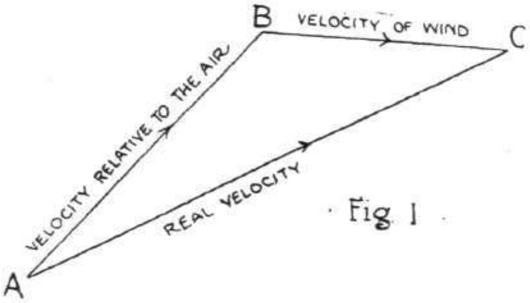


Fig. 1

Suppose a body is flying through the air with its direction of motion relative to the air along the line AB (Fig. 1), and let AB represent to scale the speed of the body relative to the air. Suppose, further, there is a wind blowing, the speed and direction of which are represented by BC. Then, obviously, if there were no wind, the body would move from A to B in an hour. If now the body were allowed to drift with the wind

Fig. 2

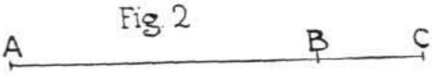
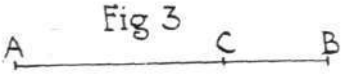


Fig 3



for a second hour it would move from B to C. As both these motions take place together, the body, instead of moving from A to B, and then on to C, would actually move from A to C along the line AC. As AC is therefore the actual length travelled in one hour, it will represent to scale the real velocity of the body both in magnitude and direction. The rule for finding the real velocity of a flying body may consequently be stated as follows. Draw AB to represent to scale the velocity of the body relative to the air. Draw BC to represent the velocity of the wind. Join A to C, and AC will represent the real velocity of the body.

If the body is moving in the same direction as the wind, AB and BC are in the same straight line, so that the length AC will be the sum of the lengths of AB and BC (Fig. 2), consequently the real speed will be the arithmetical sum of the speed of the body relative to the air and the speed of the wind. It is clear also, that if the body is moving directly against the wind, the real speed will be the arithmetical difference between the speed of the body and the speed of the wind (Fig. 3).

Now examine one or two cases of flights in the wind.

(1) An out-and-home flight of 60 miles each way, with a wind blowing outwards along the course. Let the velocity of flight relative to the air be 40 miles an hour, and the velocity of the wind 20 miles an hour. The real velocity on the outward journey is $40 + 20 = 60$ miles

Fig 4

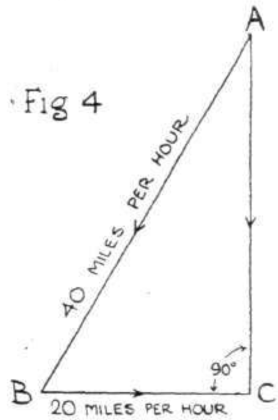
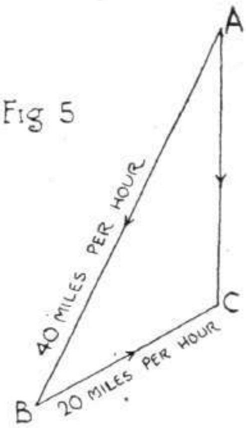


Fig 5



an hour, and that on the return journey is $40 - 20 = 20$ miles an hour. The time taken for the double journey will be $\frac{60}{60} + \frac{60}{20} = 4$ hours, as compared with $\frac{120}{40} = 3$ hours in still air.

(2) A flight 60 miles out-and-home with a side wind. The velocity diagram for this case is shown in Fig. 4.

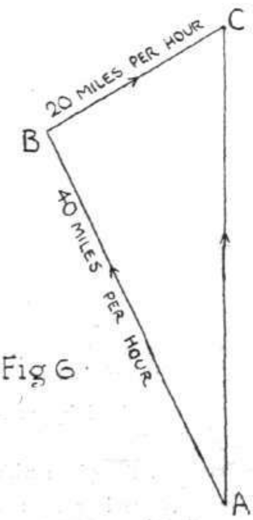


Fig 6

By measurement, or by calculation, AC is found to represent a velocity of 34·6 miles per hour. The real velocity on the return journey will also be 34·6 miles per hour, so that the time taken for the double journey will be $\frac{120}{34{\cdot}6} = 3{\cdot}47$ hours, as compared with 3 hours in still air.

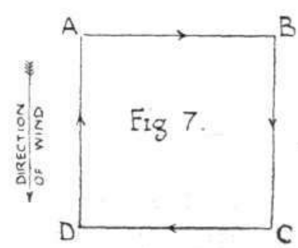


Fig 7.

(3) An out-and-home flight of 60 miles each way, with a wind blowing at 60° with the direction of the course.

The velocity diagram for the outward motion is given in Fig. 5.

By measurement or by calculation, AC is found to represent a velocity of 26 miles per hour.

The diagram of velocities for the inward motion is given in Fig. 6.

By measurement, or by calculation, AC is found to represent a velocity of 46 miles per hour.

The time of flight for the double journey is, therefore, $\frac{60}{26} + \frac{60}{46} = 3{\cdot}62$ hours, as against 3 hours in still air.

(4) A flight along the four sides of a square course, each side 60 miles long, with the wind blowing parallel to two sides of the square.

The course is shown to scale in Fig. 7.

The time of flight along the two sides, AB and CD, taken together is 3·47 hours, as found in Case 2.

The time along the other two sides, BC and DA, is 4 hours, as found in Case 1.

Therefore the total time of flight is $4 + 3{\cdot}47 = 7{\cdot}47$ hours, as compared with $\frac{240}{40} = 6$ hours in still air.

(5) A flight along the complete perimeter of a regular hexagonal course of 60 miles side, with a wind blowing parallel to two sides.

The course is shown to scale in Fig. 8.

The time along the two sides AB and BE, is 3·62 hours as found in Case 3.

The time along the two sides CD and FA, is also 3·62 hours.

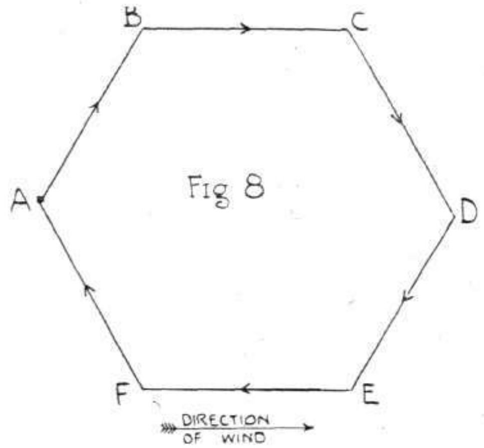
The time along BC and EF is 4 hours, as in Case 1.

Therefore the total time taken is $3{\cdot}62 + 3{\cdot}62 + 4 = 11{\cdot}24$ hours as compared with $\frac{360}{40} = 9$ hours in still air.

If we reduce the hexagon to one having a perimeter of 240 miles, equal to that of the square, instead of 360 miles as above, the time of flight will be $11{\cdot}24 \times \frac{240}{360} = 7{\cdot}49$ hours.

By comparing this time with 7·47 hours, the time taken for the square course, it appears that the shape of the course does not very materially affect the time of flight, provided the course is of the correct perimeter, and is of the form of a regular polygon. We may from the above safely assume that the time of flight round a circular course of 240 miles circumference would be practically $7\frac{1}{2}$ hours with a wind of 20 miles per hour blowing, as against 6 hours in still air.

On a course which is approximately circular, the effect of a wind blowing at half the speed of the machine is to increase the time of flight by one-quarter.



With a greater wind velocity the effect on the time of flight would be more considerable, while if the velocity of the wind were equal to, or greater than, the velocity of the machine it would become impossible to fly round the complete perimeter of any closed figure. This conclusion affords an explanation of what it is reported Latham stated at Blackpool in connection with his brilliant flight on the Friday, viz., that if the velocity of the wind had equalled his velocity he would have been compelled to give up his attempt to fly round the course.

⊛ ⊛

The Kaiser at Tegel.

ON the 4th inst., H.I.M. the Kaiser, accompanied by Prince Fushimi of Japan and Prince Henry of Prussia, paid a visit of inspection to the military airship headquarters at Tegel. He had hoped to see an ascent of the new "Gross III," but owing to the heavy fog this part of the programme was abandoned. Afterwards the Imperial party inspected the Wright flyers which are being constructed in an adjoining factory.

Eastchurch "Flight Town," the Aero Club's Auxiliary Aviation Grounds on the Isle of Sheppey.—Our photograph shows the rapid growth of the little colony which only started about three months ago. The "docks" seen, reading from right to left, are occupied by the following flyers' machines:—Mr. J. T. C. Moore-Brabazon, Mr. Percy Grace, Mr. F. K. McClean, Prof. A. K. Huntington, the Hon. C. S. Rolls, and Mr. Maurice Egerton.

The Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Annual General Meeting.

The Annual General Meeting of the members of the Aero Club of the United Kingdom will be held on Thursday, March 10th, 1910, at 5 o'clock, at 166, Piccadilly, London, W.

Notices of Motion for the Annual General Meeting must be received by the Secretary not less than twenty-one days before the meeting, and must be signed by at least five members. Wednesday, February 16th, is the last day for the receipt of Notices of Motion.

Committee.

In accordance with the rules, the Committee shall consist of eighteen members. Members are elected to serve for two years, half the Committee retiring annually. Retiring members are eligible for re-election.

The retiring members of the Committee are :—

Ernest C. Bucknall.	Earl of Hardwicke.
Vice-Admiral Sir Charles Campbell, K.C.M.G., C.B., D.S.O.	V. Ker-Seymer.
Col. J. E. Capper, C.B., R.E.	J. T. C. Moore-Brabazon.
Martin Dale.	Hon. C. S. Rolls.
	Roger W. Wallace, K.C.

The Earl of Hardwicke does not offer himself for re-election.

Any two members of the Club can nominate a member to serve on the Committee, having previously obtained such member's consent. The name of such member so nominated, with the names of his proposer and seconder, must be sent to the Secretaries in writing not less than fourteen days before the annual general meeting. Wednesday, February 23rd, is the last day for the receipt of nominations.

The following members have so far been nominated :—

Major Sir A. Bannerman, Bart., R.E.	V. Ker-Seymer.
E. C. Bucknall.	E. Manville.
Frank Hedges Butler.	Hon. C. S. Rolls.
Martin Dale.	A. Mortimer Singer.
Philip Gardner.	Hon. Arthur Stanley, M.P.
	R. W. Wallace, K.C.

Members are reminded that a ballot paper for the election of nine candidates to seats on the Committee of the Club will be forwarded to them at least seven days before the date of the annual general meeting.

No ballot paper which is signed, or on which the number of candidates voted for is more or less than the number of vacancies, or which is received by the Secretaries later than 12 noon on Wednesday, March 9th, 1910, will be valid.

Committee Meeting.

A meeting of the Committee was held on Tuesday, the 8th inst., when there were present :—Mr. Roger W. Wallace, K.C., in the chair, Mr. Ernest C. Bucknall, Vice-Admiral Sir Charles Campbell, K.C.M.G., C.B., D.S.O., Mr. Martin Dale, Professor A. K. Huntington, Mr. J. T. C. Moore-Brabazon, Mr. C. F. Pollock, Mr. J. Lyons Sampson, Mr. Stanley Spooner, and joint secretaries Capt. E. Claremont, R.N., and Harold E. Perrin.

New Members.

The following new members were elected :—

Sir George William Abercromby, Bart.	Hubert Darnell.
Col. Charles K. Brooke.	Harry Keen.
John Brown, F.R.S.	Lieut. Ernest Parbury, R.A.
Henry Albert Collier.	Arthur Russell.
Herbert Dennis Cutler.	Ernest Russell Woakes.

Gordon-Bennett Balloon Race.

Entries for the Gordon-Bennett Balloon Race close on the 22nd inst., and members wishing to eompete are requested to notify the Secretaries on or before that date. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the entrant not be selected.

The Race will take place in the United States.

Gordon-Bennett Aviation Cup.

Entries for the Gordon-Bennett Aviation Cup close on the 22nd inst., and members wishing to compete are requested to notify the Secretaries on or before that date. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the entrant not be selected.

The Race will take place in the United States.

English Aviation Pilot Certificates.

It having been decided in several European countries that competitors in International aviation meetings should hold a certificate of competency, the Aero Club has arranged to grant pilot certificates to aviators, and the conditions will be published shortly.

These certificates will be such as will enable the holders to compete in any meetings held under the Federation rules.

Aero Exhibition.

The Aero Exhibition will be held at Olympia from the 11th to the 19th March, 1910.

A special section will be set apart for models, and full particulars can be obtained from the Aero Club.

Library and Pictures.

Mr. Fred T. Jane has presented to the library a copy of his book, "All the World's Airships."

A water-colour painting of the International Balloon Race at Hurlingham in 1909 has been presented by Mr. W. H. F. Thomson.

English Aviators at Mourmelon.

Captain Bertram Dickson, a member of the Club, is making very satisfactory progress on a Farman biplane at Mourmelon. He has already accomplished a flight of 6 kiloms.

Eastchurch Flying Ground.

Commander Curtis and the Officers of the Royal Naval Depôt at Sheerness have kindly intimated that the members of the Aero Club may consider themselves honorary members of their mess.

Erection of Sheds.—Members wishing to erect sheds are requested to communicate with the Secretary of the Aero Club.

Railway Arrangements.—The following reduced fares have been arranged with the railway company for members visiting Shellbeach :—

1st Class return, 8*s.*; 2nd Class return, 6*s.* 6*a.*; 3rd Class return, 5*s.*

Tickets available for one month from date of issue.

Members desiring to avail themselves of these reduced fares are required to produce vouchers at the booking offices. Vouchers can be obtained from the Secretary of the Aero Club. Trains leave Victoria, Holborn, or St. Paul's.

For the convenience of Members, the best train is the 9.45 a.m. from Victoria, arriving at Queenborough 10.55. At Queenborough change to the Sheppey Light Railway for Eastchurch, which is ½-mile from the flying ground.

E. CLAREMONT, CAPT. R.N.,
HAROLD E. PERRIN,
166, Piccadilly. Joint Secretaries.

Hydrogen for Airships.

RECENTLY at the École Superieure d'Aeronautique in Paris, Professor d'Arnsouval has been advocating a new method of obtaining hydrogen for aeronautical purposes. He points out that pure hydrogen, which can be liquefied, may be obtained from coal gas by lowering its temperature sufficiently.

It is said that 5,142 litres of liquid hydrogen would be sufficient to inflate a dirigible of 4,000 cubic metres capacity and the weight of the liquid and the necessary vessels to contain it would only be 1,000 kilogs. This is very considerably less than the weight by the old method. The liquid hydrogen may be transformed into gaseous hydrogen either by simple evaporation or by gentle heat.

PROGRESS OF FLIGHT ABOUT THE COUNTRY.

(NOTE.—Addresses, temporary or permanent, follow in each case the names of the clubs, where communications of our readers can be addressed direct to the Secretary. We would ask Club Secretaries in future to see that the notes regarding their Clubs reach the Editor of FLIGHT, 44, St. Martin's Lane, London, W.C., by 12 noon on Wednesday at latest.)

Coventry Aeronautical Society (18 and 19, HERTFORD STREET).

ON Wednesday last, at the Queen's Hotel, at 8 o'clock, Mr. P. V. Vernon presided at a meeting of the Society, when Mr. A. P. Thurston, B.Sc., gave a lecture, the subjects being (1) "The Normal and Inclined Plane," and (2) "Streamline Surfaces, the Centre of Pressure and Resistances of Bodies."

Owing to the General Election, and the break due to the Christmas holidays, it was considered inadvisable to arrange lectures during the past six weeks, which accounts for the long interval since the last lecture.

Members are reminded that subscriptions are due on election, and if any member has not paid his subscription for this season, it would be a great convenience if he would kindly forward this to the hon treasurer as above.

The library now comprises the following works: "Aerial Flight," Vols. I and II, by F. W. Lanchester; "Aero Dynamics," by Langley; "Natural and Artificial Flight," by Sir Hiram Maxim; two little books on model aeroplanes, by W. G. Aston and E. W. Twining, and files of the aeronautical papers.

The committee will be pleased to welcome further additions to the library, or to receive suggestions from members as to books to purchase for the library.

Motor Union (Aviation Section). (CAXTON HOUSE, S.W.)

A MEETING of the Aviation Section will be held at the Royal Societies Club, 63, St. James's Street, S.W. (by kind permission), on Tuesday next, 15th inst., at 8.30 p.m., when Major J. N. C. Kennedy, R.E., will deliver an illustrated address, "Aviation from the Military Standpoint."

Members intending to be present are requested to notify the secretary, in order that sufficient accommodation may be reserved.

Mr. Patrick Y. Alexander is very kindly presenting to the Aviation Section the necessary apparatus for testing the thrust of small propellers, &c.

It has been decided that the Aviation Section shall not restrict itself to heavier-than-air machines exclusively.

Oldham Aero Club (5, CHURCH TERRACE).

THE usual weekly meeting was held at headquarters on the 3rd inst., when, after the formal business had been disposed of, a discussion on various subjects in connection with aerial navigation ensued.

A model of unique construction, made by Mr. W. H. Dean, was exhibited during the evening, and after the discussion made some very satisfactory trial flights in the room.

Mr. Dellowe also explained a very useful and ingenious speed indicator he has designed, which is extremely simple and novel.

Soc. of Model Engineers (37, MINARD RD., HITHER GREEN, S.E.)

THE eleventh annual conversazione of the Society will be held at the Caxton Hall, Westminster, S.W., on Saturday, 26th inst., from 4 to 11 p.m. Mechanical apparatus and models of every description will be exhibited. Model aeroplane section, demonstrations of turning and other mechanical processes. Concerts, lectures, and dancing. Readers are invited to exhibit model aeroplanes or parts, and are requested to write for space (free) to the secretary. Admission by ticket (price 2*s.* 6*d.*, including refreshments) to be obtained of the secretary.

Women's Aerial League (227, STRAND, W.C.)

A VERY successful gathering was held at the Criterion Restaurant on the afternoon of the 3rd inst., at which Mrs. Hutton received the guests, who were afterwards entertained to tea. During the meeting Mr. C. C. Turner gave a short address, explaining the objects of the League, and drawing special attention to the national need for adequate aerial defence. He said that England was behind Germany, and to be one year behind was as bad as being fifty years behind.

THE HELIOPOLIS MEETING.

THE amount of flying accomplished on Sunday last, the opening day of the Heliopolis meeting, although not very great, was satisfactory. Rougier easily won the three daily prizes for distance, speed and height, the first with 65 kiloms., the second with a height of 195 metres, while his time for the 10 kiloms. in the speed test was 9 mins. 30 secs. The next best performances, from the point of view of distance, were Balsan (Blériot), 44 kiloms.; Reimsdyck (Curtiss), 24 kiloms.; and Metrot (Voisin), 18 kiloms. The last mentioned also secured second position for height by rising to 40 metres. The day did not pass without an exciting mishap, for while Gobron was flying at a height of about 40 metres his machine suddenly burst into flames, and although his descent was a very rapid one, he landed safely. Among the distinguished visitors on the opening day was H.H. the Khedive.

A strong breeze interfered considerably with the flying on Monday, when the German aviator, Grade, carried off the honours, beating Rougier in the distance and speed events. In the former, both flew 20 kiloms., but Grade's time was 22 mins. 57 secs., against Rougier's 24 mins. 46 secs.

In the speed event, Grade's time for the 10 kiloms. was 11 mins. 6 secs., while Rougier could not do better than 11 mins. 24 secs. Rougier again secured the height prize, and on this occasion his altitude was 219 metres.

Tuesday was a blank day, for the stiff breeze which persisted all day prevented any flying. In the evening Balsan went up in his racing Blériot, although after one round the machine fell, but the aviator escaped with a few scratches.

FLYERS AT OLYMPIA NEXT MONTH.

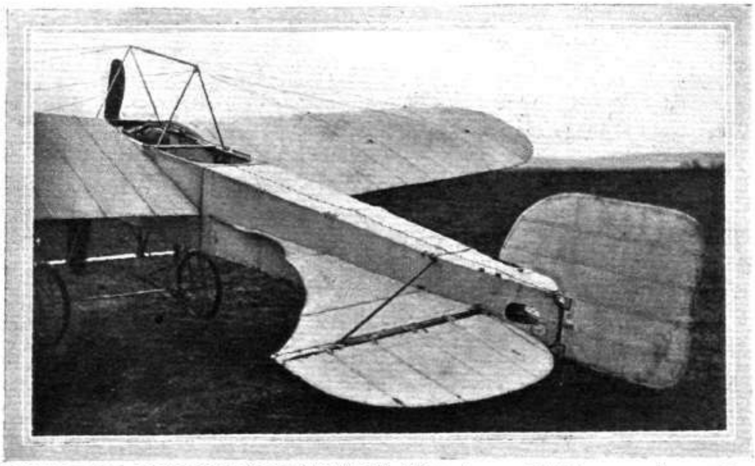
THE Exhibition which is to be open at Olympia from March 11th–19th promises to easily eclipse that of last year, for all the space available for full-size machines has been allotted and at least thirty flying machines will be on view, including the Wright, Farman, Blériot, Santos-Dumont, Clement, and the British-built Short machine of Mr. Moore-Brabazon and the Short-Wright machine of the Hon. C. S. Rolls. There will be a healthy proportion of British-built machines and as nearly all those on view will be of different types, there will be a much greater variety than last year. There will also be dirigibles and balloons on view, a fine collection of engines and accessories connected with flying, as well as a splendid array of motor boats and marine engines.

This year the band will be located in the centre of the ground floor, and around it a promenade will be formed. Ample seating accommodation will be provided for visitors and everything possible is being done to make the Show extremely entertaining as well as instructive. A cinematograph exhibition, which proved so attractive last year, will be given, the films dealing both with historical and latest events on record in the aviation and motor boat world.

AVIATION NEWS OF THE WEEK.

M. Blériot at Pau.

M. BLÉRIOT returned to Pau on the 4th inst., and the next day was making several experiments in landing by stopping the motor and gliding down. He also stopped the motor several times during a flight, and skimming down to a short distance of the ground, started again and rose to a height of twenty metres. Lieut. Aquaviva, the military pupil, is making splendid progress, and will shortly make the necessary flights to qualify for the Ae.C.F. pilote-aviateur certificate.



THE NEW BLERIOT MONOPLANE.—This is modified in several respects. The main body is 1 metre shorter, viz., 6·6m., whilst the elevators, as will be seen from the above side view from behind, have been considerably altered.

Ae.C.F. Pilots.

MM. ERNEST ZENS and Roger Sommer have been granted the pilote-aviateur's certificate of the Aero Club of France.

M. Blériot to go to Belgrade.

IT is reported from France that M. Blériot has signed a contract to a make a series of exhibition flights at Belgrade on April 17th and following days.

Flying at Liege.

M. ALLARD made several good flights up to 10 kiloms. in length on the Waleffe's flying ground near Liege, on the 6th inst., the performances being officially timed by the local Aero Club.

Molon at Havre.

ON the 3rd inst. Molon flew for 40 minutes over the country surrounding his aerodrome. He had intended flying to Octeville, but the heavy rains caused him to abandon this project.

M. Sommer after Records.

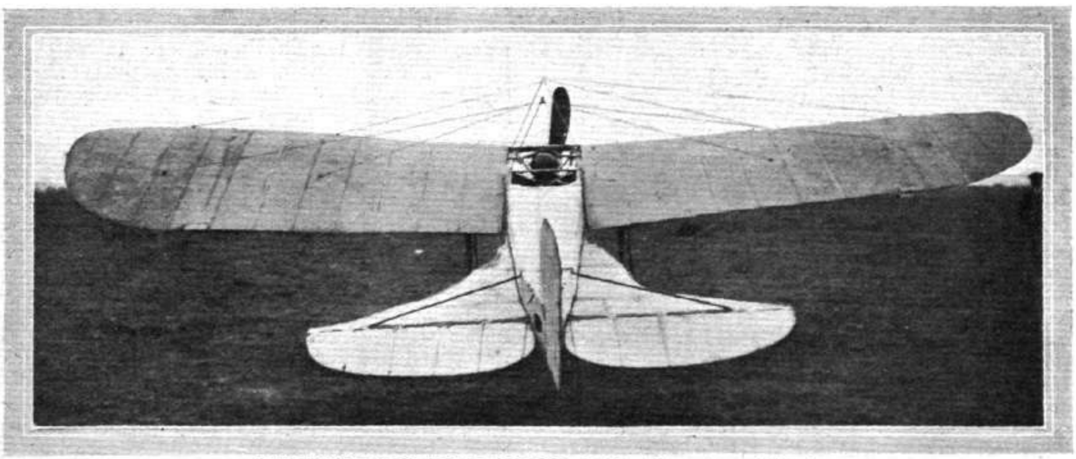
M. SOMMER has been making a good many flights recently varying up to 20 minutes in duration, and on the 4th inst. he set out to try and beat the duration record, but was obliged to land after four rounds of the course owing to the petrol supply-pipe breaking. The next day, in a high wind, M. Sommer made a short flight carrying a load of 20 kilogs. and 130 litres of petrol.

He has just sold one of his machines to Amerigo, who has been experimenting at Leipzig for some time past.

French Military Aeroplanes.

ON the 6th inst. General Brun, the French Minister of War, made a visit to Villacoublay, to inspect the four Wright machines which have been built for the French Government. Count Lambert explained the mechanism of them, and would have given a trial flight but for the very high wind. At the same time the Antoinette and Henry Farman machines for the army were inspected at Mourmelon by an artillery officer, Commandant Estienne.

Van den Born was testing one of the Henry Farman machines on the 3rd inst., and flew for 35 mins., carrying



THE NEW BLERIOT MONOPLANE.—View from behind.

a useful load of 201 kilogs. He is now actively at work teaching several military officers, while Kuller has the Government Antoinette pupils under his charge.

New Belgian Prizes.

M. GEORGES BRICHANT, a well-known Belgian sportsman, has just founded four prizes of £100 each. The first will be used to provide a cup for a balloon contest, while the others will be awarded by the Belgian Aero Club to the Belgian aviators who fly and carry on an aeroplane the greatest load in a given time.

A New German Flyer.

ON the 4th inst., a monoplane, which has been designed and built by Herr Hilsmann, was given its first trials at Essen, and several long jumps of 60 to 100 metres were made.

The Parseval Monoplane.

THE monoplane which Major von Parseval recently designed has now been completed and is being taken to Plau, in Mecklenburg, where it will be tested along the shore of the lake. The machine has a span of 14 metres, while it is 7 metres long and is fitted with a motor of 114-h.p.

Paulhan at Denver.

ON the 2nd, 3rd and 4th inst. Paulhan was giving exhibition flights at Denver, but in view of the intense cold, which numbed his limbs, did not attempt any lengthy or high flights. On the 4th he met with a mishap, as his Henry Farman machine fouled one of the fences round the course. Several people were knocked over, and Paulhan was thrown out, but no one was seriously injured; the aeroplane, however, was considerably damaged.

Curtiss after Endurance Records.

IT is reported from New York that with a view to making a determined attempt to beat the duration records, a big biplane is being built to the designs of Mr. Glenn Curtiss, which will have planes twice the size of the ones on his present machine, with which he has made speed records. He will continue to use a 25-h.p. 4-cyl. motor.

Bregi in South America.

LARGE crowds assembled to see Signor E. Bregi make his flights at Buszaco, near Buenos Ayres, on his Voisin machine on Sunday last. Two trials were made, the first lasting for 8 mins. 17 secs., and the second for 8 mins. 53 secs. The greatest altitude was attained in the latter test, when Bregi was at times flying at a height of 100 ft.

AIRSHIP NEWS.

Accident to the Forlanini Dirigible.

AN unfortunate mishap befell the Forlanini dirigible, of which we gave several illustrations last week, during a trial trip from its shed at Crescenzago to Parie. When about 3 kiloms. from Parie one of the motors stopped, and Signor Forlanini decided to land in order to effect repairs. This was accomplished satisfactorily, but when starting again the balloon was driven against a tree and a hole torn in the envelope. This allowed the gas to escape, and although the vessel rose to a fair height, it suddenly dropped to earth again, but fortunately the three occupants of the car escaped without injury.

CORRESPONDENCE.

⁂ The name and address of the writer (not necessarily for publication) MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents asking questions relating to articles which they have read in FLIGHT, would much facilitate our work of reference by kindly indicating the volume and page in their letters.

NOTE.—*Owing to the great mass of valuable and interesting correspondence which we receive, immediate publication is impossible, but each letter will appear practically in sequence and at the earliest possible moment.*

PROPOSED MODEL AERO CLUB FOR LONDON.

[346] It has been suggested that a model aero club be formed in London.

There will, no doubt, be many of your readers who would like to join and if they will send me a stamped addressed postcard I will arrange a suitable meeting place, where the project may be discussed.

2, West Grove Terrace, A. C. HORTH.
The Point, Blackheath, S.E.

[We deal specially with the above proposal on our leader page. —ED.]

MODELS.

[347] I have constructed a model monoplane of cane, the length of it is 25 ins., the main plane is 22 ins. by 6 ins., and the tail 10 ins. by 7 ins.

The weight of it is 7 oz. The monoplane when sent from the hand glides very well. I have frequently got glides of 30 ft. to 40 ft. I was wondering if you or some of your readers could answer me the three following questions:—

1. Would an 8 in. propeller (tractor) be too large for it?
2. I intend having my elastic motor about 18 ins. long. How many strands of $\frac{1}{16}$ elastic would be required to drive the model?
3. When the elastic is wound up fully, for how many seconds should the propeller revolve?

Wishing FLIGHT every success,
Blackpool. R. W. MAWDSLEY.

[Questions such as those raised by our correspondent are at present unanswerable except by other readers who happen to have experimented with models of approximately the same size, and it is on the *esprit-de-corps* that has so characterised these pages of FLIGHT that we rely for the assistance that is nominally of direct and immediate use to only one reader at the present time, but is of probable interest to a great many others.

The numerous letters of appreciation that we have received on the subject show us that this co-operation in the present early days of the movement is being of great assistance to the furtherance of the progress of flight in England, and we feel sure that those who are so generously assisting others with the information that they have themselves obtained, possibly not without considerable trouble, will never regret their useful actions.—ED.]

THE ROE TRIPLANE.

[348] I was much interested in Mr. Roe's letter in a recent issue, and I think every credit is due to him for the plucky way in which he has stuck to his triplane. There is no doubt that had he received as much financial support as some of our Continental rivals he would have achieved earlier success.

Personally I am no advocate of the triplane, because I do not think it can ever be designed so as to develop the extreme speeds which we may look for in the not very distant future; but at the same time the triplane may be found to fill some useful purpose, and it would appear that Mr. Roe has actually flown with less power than is used on any other well-known type of machine.

It would be very interesting to know—and I hope Mr. Roe will

give the information—what is the number of revolutions at which the 85 by 92 engine gives off the 9-h.p., and also what is the total weight of the engine. If it is merely an ordinary standard pattern engine, then the machine is severely handicapped by carrying a lot of unnecessary weight, and if it were equipped with a specially designed light engine, like the Continental machines, he would obtain far superior results.

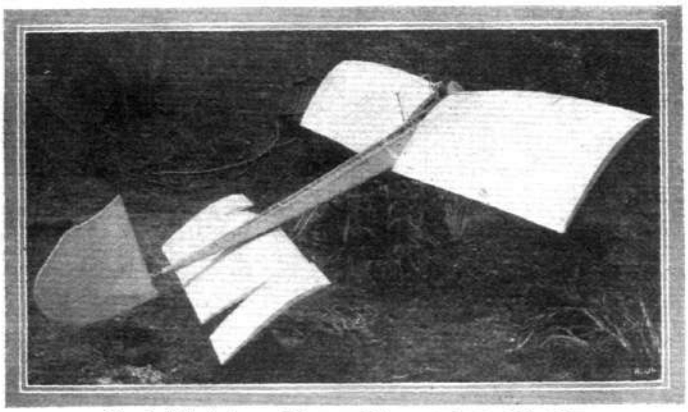
An engine with such a short stroke as he mentions should be quite capable of running satisfactorily at 2,500 revs. per minute, and at that speed it should give off more than 9-b.h.p., that is assuming that the ports and passages, &c., are properly designed for that speed. And if 9-h.p. is all the power that is actually required, then a still smaller engine, with consequent reduction in weight, should do the work.

Barnes. CYLINDER.

FIRST MOTOR-DRIVEN MODEL.

[349] Enclosed you will find two photographs of a working model monoplane, which is, I believe, the first of its kind fitted with a petrol engine.

The machine is more or less a scale copy of the Blériot, has an 8 ft. spread, and an overall length of 6 ft. It is fitted with one of the Automobile Supply Co.'s ½-h.p. air-cooled petrol engines. The weight ready for flight is under 15 lbs.



Mr. J. Urlwin's working model monoplane, side view.

The framework has been constructed of close-grain deal throughout, and particular attention was given to the manufacture of the ribs for the main-planes. Two hundred and fifty of these were cut from the solid, and the best specimens selected. The planes are single surfaced on the upper side. Rubber-proofed fabric has been used, the fabric being fastened in the first place by drawing-pins, and gradually stretched.

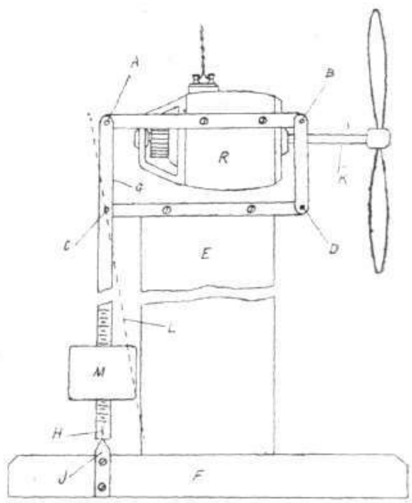
There are several original features in the construction of the machine, one of which is the shock-absorber, and another the method of tilting the main-planes to vary the angle of incidence.

The object of the model is to experiment on the subject of inherent stability in machines of this type.

Bletchingley. J. URLWIN.

PROPELLERS.

[350] Replying to F. C. Harrop's letter (268), in your issue of the 1st inst., I enclose herewith diagrammatic sketch showing an apparatus suitable for ascertaining the thrust of small screws. The arrangement consists of an electric motor, R, mounted on a framework consisting of four straight pieces of metal on each side of the motor. The metal pieces are pivoted at A, B, C and D, the bottom piece being fixed to the wooden support, E, secured to the base, F, in such a manner that the motor can swing from right to left, and *vice versâ*, but the frame is normally kept in position by one of the side pieces, G, being extended downwards, and provided with a counterweight which can be slid up or down. When at rest the centre mark, H, at the bottom extremity of G, coincides with the pointer, J. Different propellers which it is desired to test can be mounted on the motor shaft, K. When the propeller is fixed in position and the motor started, the thrust will cause G to swing into a position out of the vertical, as indicated by the dotted line, L, when the motor has reached the correct speed, the weight, M, is slipped down until H again coincides with the pointer, J. The part of G, below the pivot, C, is marked with divisions so that the exact

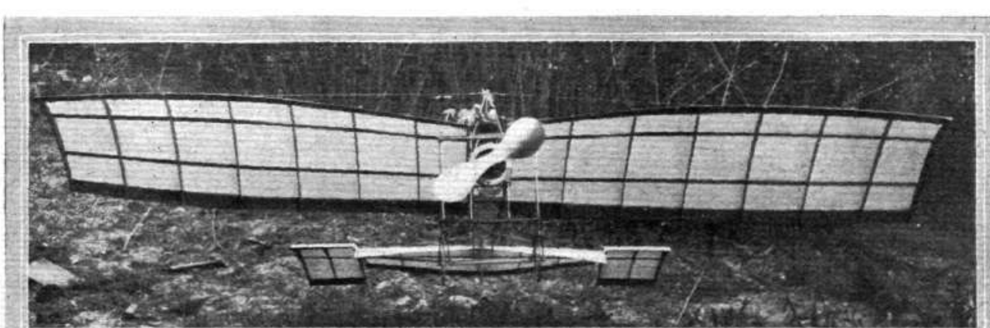


position of the weight, M, necessary to bring G back to the vertical under the influence of the thrust can be noted.

If an ammeter is fixed in the motor-circuit, it will indicate the proportionate power required by different propellers to produce the thrust indicated by the position of the weight, M, at any given speed. An electric motor takes current exactly in proportion to the power absorbed (the current required to run the motor light should be deducted from each reading). The divisions on G can be arranged to indicate the thrust in lbs. or other suitable unit.

By noting the speed, current, and position of M, and tabulating these results, a good deal of information as to the merits of different propellers could be obtained.

Holland Park. JAMES F. CLUNAS.



Front view of Mr. J. Urlwin's model monoplane.

[351] Mr. F. C. Harrop (329) and Mr. G. H. Challenger (328) may better solve the problems of the screw propeller by considering the actions from a "velocity" point of view instead of a "difference of pressure" point.

The pressure which propels the screw forward exists only on the surface of the propeller-blades, and is equal and oppositely opposed between the blades and the air in contact at any moment with their aft surface.

The propeller is working in a fluid which presses in every direction with a pressure of about 15 lbs. per sq. in., and air moves with high velocity under small difference of pressure, so that no great, or even very small pressure difference can exist between two points in the air only a foot or less apart. It is a velocity problem. The air enters the screw at a velocity, S, equal to that of the machine it is driving. The blades then accelerate it to a higher velocity, V, while it is in contact with them; and this acceleration is the cause and measure of the thrust of the screw.

Glasgow. RANKIN KENNEDY.

[352] In your lucid and informing article on Aerial Propellers, which is just what many readers must have long desired, I note this remark (p. 36, under head, "Pitch of a Propeller"):—

"The angle of the blade is neither constant from root to tip, nor constant from leading edge to trailing edge. A constant blade angle from root to tip would result in a variable pitch, and a constant blade angle from leading edge to trailing edge would produce a flat blade, which, from the analogy of the aeroplane, might well be expected to be less efficient than one suitably cambered."

In the recently published "Des Helices Aeriennes," by S. Drzewiecki, I find a passage (pp. 26–27) which appears adverse to this form of screw:—

"In our opinion, it is an error to give to the blades of aerial screws the slight concavity which is usually given to sustainers, in order to increase their carrying power. For sustainers there is certainly a gain in increasing by all means possible the lift per unit area, at the risk even of increasing also the drift, for every diminution of the supporting surface signifies a proportionate diminution of the weight that it has to carry; and, moreover, the solidity of the structure cannot but be improved; the only compensation necessary is to increase a little the power of the motor. But it is by no means the same for screws; their business is to utilise for propulsion the power of the motor to the best possible advantage, a reduction in the weight of the screw has only an insignificant influence on the total weight, while on the other hand every increase of resistance to rotation entails, as we have seen, a very notable diminution in the efficiency of the propeller. The defenders of the practice of curved blades often invoke, in favour of their thesis, the argument that the filaments of air meet without shock the surface of a concave blade tangentially to the entering edge, and that these filaments are deflected progressively till they emerge along the trailing edge, after having, by their reaction on the blades, produced the maximum of thrust, after the manner of that which is produced in turbines with curved blades. In our opinion, the two phenomena are not comparable, because in turbines it is only a single bunch of isolated filaments which strikes the curved blade, and it is, in fact, deflected entire; whilst the blade of the screw encounters parallel filaments of air all along its depth, and if those which enter tangentially to the angle of entry are progressively deflected by the concave surface of the blade, as in a turbine, it is by no means the same with the other filaments which strike the surface of the blade all across its breadth, and especially towards the rear part, where meeting the increasing and excessive angles of incidence at the point of maximum pitch, this diminishing considerably the effectiveness of the propeller. This is why, until the contrary is proved, we think it preferable to give to the blades of propellers helicoidal-plane surfaces, and not concavo."

I enclose original, as a means of checking my inexpert translation. Maxim, in his "Artificial and Natural Flight," quotes his experiments as leading to a similar conclusion, he finally giving his screws only sufficient camber to counteract deformation by air pressure.

Your article was of necessity limited in space, but this question of flat or curved blades is so fundamental that I am sure an elucidation and final pronouncement would be welcomed by many readers.

On a later page of "Des Helices Aeriennes" the author observes that bench tests of screws, without travel through the air, are only applicable to the supporting screws of helicopters, and applied to propellers are absolutely fallacious, the indications obtained having nothing in common with those arrived at under proper conditions. He recommends the placing of the testing apparatus in a tunnel of moving air.

Apologising for the length of this. F. C. HARROP.

[Our correspondent raises an extremely interesting point on the subject of propeller design—viz., whether it is worth while cambering the faces of the blades on the ground that inasmuch as a propeller-blade is an aeroplane it should be designed on similar lines. Our correspondent quotes an article of our own in support of cambering, and also brings forward a quotation from Drzewiecki's "Des Helices Aeriennes," in which the author argues that flat surfaces are preferable to cambered surfaces for propellers, although he admits that the contrary is the case for aeroplanes.

While the point at issue remains a question of theory, our opinion differs from that of M. Drzewiecki, although we would add, as he does, the proviso "until the contrary is proved." M. Drzewiecki's argument as quoted above by our correspondent is, we think, hardly logical. He speaks of the deflection of the filaments of air as if one and all gained free access to the face of the propeller blade; in other words, he assumes as his hypothesis the Newtonian medium for air, which is known to be inexact, and was so admitted by Newton himself.

Athough it is convenient to give to the mind imaginary pictures of intangible objects, it is very important not to use them too far as a basis for practical deductions. The Newtonian theory, for instance, is a most useful hypothesis, primarily as a means of proving itself inexact.

Air is not an inviscid fluid as the Newtonian medium supposes, consequently, when the "filament" of air is deflected by some solid object like an aeroplane or a propeller blade, which we contend are fundamentally the same in principle, other filaments in the vicinity are deformed by the first. Thus, after the turbulence immediately following the setting in motion of some aerial system has subsided, the air forms itself into streams of considerable depth and extent, the streams being composed of an infinite number of filaments. Only one stratum can slide along in actual contact with the face of the propeller blade or aeroplane as the case may be, the other strata being deflected on top of the first, and conforming to its path in every way. The depth of the strata thus influenced depends on various factors, principally the compressibility of the air, and its effective value is at present an unknown quantity, upon which information is much wanted. It determines the gap between superimposed planes in biplanes and triplanes, and it is a fundamental factor in any formula that may be devised for the calculation of lifts and pressures from the velocity of air in motion.

The above is, it is true, mainly a theoretical point of view, but it is a very reasonable hypothesis as a little consideration will show. No matter in what light the actual constitution of the air may be regarded, it is perfectly evident that its mass cannot be ignored. If, therefore, a "lump" of air is assumed to have struck a propeller-blade, its subsequent movements must be satisfactorily accounted for in order to deduce a reasonable theory on the dynamics of its action. To argue, as it seems to us is done by M. Drzewiecki, that every lump of air in a stream actually hits the face of the propeller is to suppose that each lump vanishes at the point of contact, as if it were actually absorbed within the material of the propeller itself, or had passed through the blade to the other side. If, as is more reasonable, it is supposed that such particles of air as happen to actually strike the face of the propeller-blade slide along it until

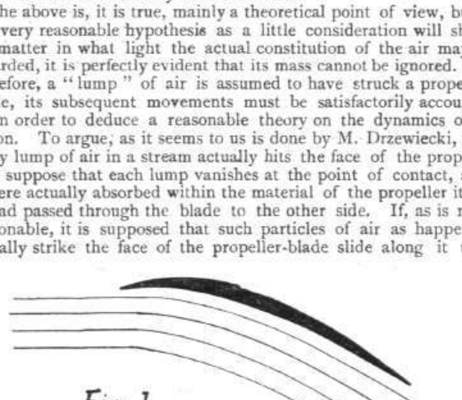


Fig. 1.

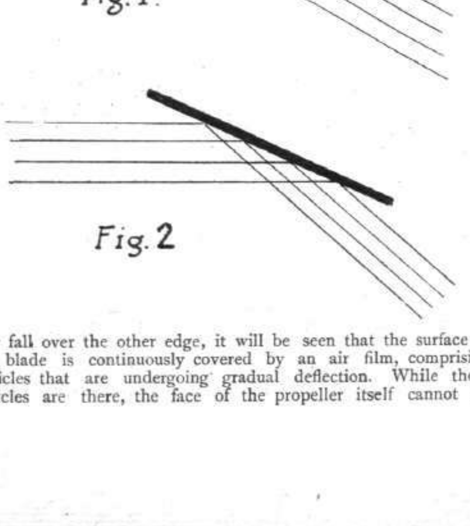


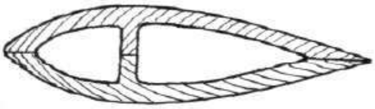
Fig. 2

they fall over the other edge, it will be seen that the surface of the blade is continuously covered by an air film, comprising particles that are undergoing gradual deflection. While those particles are there, the face of the propeller itself cannot be

struck by others, but, as we have explained, this in no way prevents the formation of a stream of uncertain depth being deflected indirectly by the propeller and without actual contact. This condition is illustrated diagrammatically in Fig. 1, while the impossible state of affairs that would ensue were every particle of air to strike the face of the blade and to rebound therefrom is shown in Fig. 2, where the crossing of the paths of different filaments suggests how reasonable it is for nature to prefer the state represented in Fig. 1.—ED.]

HOLLOW SPARS.

[353] As I notice that some of your readers have lately been making inquiries about hollow spars, it may be of interest to state that my firm is, I believe, the only one in England which manufactures these hollow spars for aeroplane work. At the Aero Show in March, 1909, I exhibited samples of various sections, and found that they created a great amount of interest. (I enclose for your inspection a sample of one of my hollow icthyoidal strut sections.) I also showed there a length of silver spruce 30 ft. long, perfectly straight-grained and flawless, and since then I have been informed that MM. Voisin Frères are now obtaining this timber from the same source as myself.



SECTION OF SPAR

Three and a half years ago I constructed my first glider of silver spruce, and I think this was the first time that this wood had ever been used in England for this or any other purpose.

I am very glad to see that my friend, Mr. Linton Hope, who compares (in your issue of January 1st, 1910) small racing-boat work with that of aeroplane building, endorses my opinion of this material.

T. W. K. CLARKE.

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Index and Title-Page for Vol. I.

THE Index and Title-Page for Vol. I, January to December, 1909, of FLIGHT, has now been published. Any reader may obtain one by sending *2d.* to the publishers, 44, St. Martin's Lane, London, W.C. After February 28th, a charge of *6d.* post free will be made.

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POINTS TO NOTE.

AT the recent Aviation Exhibition only one big prize was awarded, and that was secured by the F.I.A.T Co. for their flight engine, which also receives the gold medals offered by the Minister of War and the Touring Club.

THE N.E.C. aeroplane engine is steadily advancing in favour. Amongst the most recent aviators to place an order for one of the 35-40-h.p. engines are Messrs. A. V. Roe and Co. With this new engine they hope to make many prolonged flights on the type of aeroplane with which their name is associated, and with which they have already had such considerable success.

THE Simms Magneto Co., Ltd., have recently come to an arrangement with Messrs. G. H. Smith and W. H. Dorey, who will in future act as their West-End agents. Messrs. Smith and Dorey will keep a stock of Simms magnetos, sparking plugs, spare parts, &c., &c., at their West-End house, from where the many users of these magnetos will be able to obtain supplies.

MESSRS. HUMBER, LTD., have just issued their aeroplane catalogue, which gives illustrated details, both of the Humber monoplanes and biplanes, and also of the 20-h.p. 3-cylinder and the 50-h.p. 4-cylinder engines for flying machines.

WE understand that the works of Messrs. A. V. Roe and Co. are now in full swing, and orders have been placed with all the leading engine makers—Greens, New Engine, and Jap—for engines for experimental purposes, with a view to making the aeroplanes produced by the firm still more efficient.

As showing that the British product is not altogether despised abroad, it is interesting to know that the Aeroplane Supply Co. have just executed an order for a large quantity of British-made aluminium lugs for a Belgian firm.

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IMPORTS AND EXPORTS.

Aeroplanes, airships, balloons and parts thereof (not shown separately before 1910).

Imports.	Exports.	Re-Exportation.
Jan., 1910 ... £2,516	Jan., 1910 ... £750	Jan., 1910 ... £550

DIARY OF FORTHCOMING EVENTS.

British Events.

1910.		1910.	
Mar. 11-19	Flight Exhibition at Olympia.	Aug. 6-13	Flight Meeting, place not fixed.
July 11-17	Bournemouth Flight Meeting.		

Foreign Events.

1910.		1910.	
Feb. 6-13..	Heliopolis.	July 14-24	Rheims to Brussels, cross country event.
April 2-10	Biarritz.	July 24-Aug. 10	Belgium.
April 3-10	Cannes.	Aug. 25-Sept. 4	Deauville.
April 10-25	Nice.	Sept. 8-18	Bordeaux.
May 10-16	Berlin.	Sept. 24-Oct. 3	Milan.
May 14-22	Lyons.	Oct. 18-25	America. Gordon-Bennett Balloon Race.
May 20-30	Verona.	Oct. 25-Nov. 2	America. Gordon-Bennett Aeroplane Race.
June 5-12	Vichy.		
June 5-15	Budapest.		
June 18-24	St. Petersburg		
June 26-July 10	Rheims.		

Aeronautical Patents Published.

Applied for in 1909.

Published February 10th, 1910.

2,593. H. E. HUGHES. Kite.
8,179. MOTORLUFTSCHIFF-STUDIEN GES. Sustaining planes for aeroplanes.
18,767. J. SCHILLING. Balloons, airships, &c.
18,768. L. LEVIN AND F. HURWITZ. Gas-bags of balloons and airships.
19,823. SOC. ANON. "ASTRA." Propulsion of airships.

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2,	Jan. 9,	*containing*	Table of Propellers ...	1	6
3	,, 16	,,	,, Engines ...	3	0
4	,, 23	,,	Engines at Paris Salon ..	3	6
6,	Feb. 6	,,	"How Men Fly" ... Aeronautical Bibliography. Wright Bros.' Elevator Patents.	1	0
8	,, 20	,,	Flying Ground at Fambridge Illustrated Glossary.	1	0
10,	Mar. 6	,,	Human Side of Flying ... Aero Club Ground at Shellbeach. Military Aeronautics.	1	0
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